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Analysis of Students' Knowledge of Class II about the Use of the Visual Aids, Traditional Abacus

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ABSTRACT

The use of visual aids that were inadequate resulted in a lack of understanding of class II students at Islamic Elementary School Insan Mulia Semarang on basic concepts of integer multiplication and division. The visual aid that can help students understand basic concepts of integer multiplication and division is the traditional abacus. Before looking at the effectiveness of using a traditional abacus in learning mathematics, students' knowledge of the use of a traditional abacus will be analyzed. The method uses a qualitative descriptive. A Guttman scale, structured interview guidelines, and clarification of the questionnaire statements is data research collection technique. The result is that many class II already know the shape and use of the traditional abacus. They admitted that they already knew the traditional abacus for learning to start counting since they were in Kindergarten.

Keywords: *students' knowledge; visual aids; traditional abacus.*

INTRODUCTION

Education is currently a very important need in life in society or the development of the nation and state. The progress of a nation can be determined by its education (Kristiawati, 2021). Education can develop self-potential in dealing with life's problems. The goal of national education is to develop potential and form good character in humans (Kristiawati, 2021). Therefore, the learning atmosphere and learning process in class must be interrelated with life to achieve national education goals. Education is also to improve human resources with character and quality supported by effective and fun learning processes and objectives in class (Santosa, Nurfaizah, 2022). To create an effective and quality learning process, the teacher must provide a concrete description of the material presented so that it can have a direct impact on students (Mahendra et al., 2022). A quality and fun learning process can be supported by the existence of learning resources, and the use of media, and visual aids. The use of media and teaching aids in the learning process is part of the facilities that must be owned by every school. In the learning process, students are also expected to become subjects while teachers have a roof of motivators and facilitators (Auliana et al., 2017). Teachers must also provide a concrete description of the material presented to their students (Mahendra et al., 2022).

One of the subjects in the Indonesian curriculum and appropriate when using media and visual aids is mathematics. Mathematics subject is a science talk about understanding the forms of an abstract structure and is needed for everyday life. According to the National Education Standards Agency (2006), mathematics is a universal science that underlies the development of modern technology, has an

important role in various disciplines, and advances human thinking. Mathematics subject is a science that deals with understanding the forms of an abstract structure and is needed for everyday life. Mathematics is the science or knowledge of logical thinking that humans need to survive and is the basis for the development of modern technology (Standards, Curriculum, 2022). Mathematics plays an important role in various subjects and contributes to the development of the human mind. Mathematics plays an important role in the life and development of science and technology (Anugrahana, 2019).

Mathematics is synonymous with science which emphasizes logic, absolute and far from the application of everyday life (Anjasrina et al., 2020). In Indonesia, many students think that mathematics is a difficult subject. Mathematics is a subject that tends to be of little interest to students, most of them think that mathematics is a very difficult and boring subject, so this subject is not so popular compared to other subjects (Pradana & Ummah, 2020). Mathematics is arranged in the mastery of the material from easy to difficult levels. Mathematical material that is often considered difficult by students is addition, subtraction, division and multiplication, flat shapes, and geometric shapes (Mahendra et al., 2022). Even though in real life material in learning mathematics is often used and applied to daily activities. One of the expectations of learning in elementary schools is that students have knowledge and abilities. One of the abilities that need to be developed is the ability to count (Rahmi et al., 2020). One of the processes that hinder learning mathematics besides forgetting formulas is the counting process (Dianto et al., 2018). Learning mathematics in primary school lays the foundation for important concepts that form the basis for learning at the next level.

The topic of this study was taken based on the experience of researchers when teaching for 4 years at Islamic Elementary School Insan Mulia Semarang. Ineffective teaching and learning processes result in students being lazy to learn mathematics, teachers are not precise in determining learning models, and teaching aids are not used as learning media, resulting in less optimal learning outcomes in mathematics (Mutmainah et al., 2019). Researchers also encountered this problem, namely the use of media and mathematics teaching aids that support learning in schools was inadequate, so teachers only used books, whiteboards, and simple teaching aids in the school environment. The use of inadequate teaching aids resulted in a poor understanding by students of the basic concepts of multiplication and division into,gers, especially in class II. Insan Mulia Semarang on multiplication and division of integers is still less or less than KKM. To do this it is necessary to change the educational process, namely by visual aids because mathematics is an abstract science that requires concrete objects to be more clearly understood. The use of visual aids in learning mathematics is very important to make it easier for students to construct knowledge. The use of visual aids in learning mathematics can produce good learning outcomes (Cope, 2015). One of the roles of teaching aids is to lay down the basic concepts. Make educational materials available in schools to make it easier for students to understand the material for learning mathematics (Suliani, 2020).

A traditional abacus is a visual aid that helps students understand the basic concepts of integer multiplication and division. An abacus is an ancient calculating tool made of nailed wooden boards filled with an array of stone beads. The abacus consists of strings of dekak-dekak made of wood or mica or mote which are designed in ten rows (Nurwati, 2013). An abacus is a calculating tool that is often found anywhere. The abacus itself has existed since ancient times and was used in the era of 2,700-2,300 BC (Mahendra et al., 2022). The abacus is useful to make it easier for us to do the counting process (Zuliana et al., 2015). The abacus can help students in the

process of learning mathematics. Learning with abacus learning tools is a way for teachers to increase students' enthusiasm and interest in learning mathematics (Rahadyan et al., 2020).

Research using the abacus teaching aid has been carried out in 2020 and 2021 with the results of the study showing an increase in numeracy skills through the abacus teaching aid (Olua et al., 2021). Furthermore, the results of using the abacus teaching aid proved to be effective in assisting students with fast and precise counting skills (Anjasrina et al., 2020). Then the use of Grade 3 abacus teaching aids also shows an increase in student activity and activity in the teaching process (Kristiawati, 2021). Research on the abacus teaching aid in 2022, shows that there is an impact of using the abacus, including through game activities using the abacus teaching aid students will feel interested, students will not feel bored and bored, so that through the use of the abacus learning aids can improve learning outcomes students, especially in mathematics (Wijayanti & Suswandari, 2022).

However, before seeing the effectiveness of using traditional abacus teaching aids in learning mathematics. Researchers will analyze students' knowledge about the use of traditional abacus teaching aids. How much do students know about the traditional abacus teaching aid and its use in learning mathematics in class when it has not been introduced or explained by the teacher? From students' knowledge of traditional abacus teaching aids and their uses, it is hoped that they can continue to research the effectiveness of using traditional abacus teaching aids in learning mathematics with novelty and research urgency.

METHODS

This research method uses a qualitative research method as it collects data from the opinions of the target audience. The data collection techniques used are Guttman scale questionnaires and structured interviews and questionnaire statements. Furthermore, it combines two main activities, namely the results of questionnaires from students and interviews (Suliani, 2020).

The Guttman scale was created by Louis Guttman in 1944 as an analytical scalogram. The Guttman scale has the advantage that by looking at one response it can be used to predict responses to all statements on the scale and to create short questionnaires with good discriminating abilities (Yulianto, 2020). On the Guttman scale, statements can be sorted from easy to difficult, so that the subject's behavior can be predicted from the total score. That is, by only knowing the total score, it can be estimated how well know the level of knowledge of the second-grade students about the traditional abacus teaching aid. The qualitative research design used is descriptive qualitative which intends to understand and analyze second-grade students' knowledge about using a traditional abacus lesson will help them learn the basic concepts of multiplication and division.

The sample data source was selected by non-probability sampling, namely purposive sampling where the research subjects were determined before the research was conducted, namely students in class II Islamic Elementary School Insan Mulia Semarang as many as 28 students. The sample data source is snowball sampling because it will develop after being in the field. A descriptive qualitative analysis was used in this study. Field data collection was analyzed using the Milo and Huberman model through the interactive reduction of data collection to data submission and verification processes (Rijali, 2019). Data reduction included filling in a Guttman scale-type questionnaire for class II students. The presentation of data includes the results of filling out a Guttman scale-type questionnaire and the results of direct interviews with several grade II students. Verification, namely concludes by comparing the results of filling in a Guttman scale-type questionnaire and the results of interviews with students.

RESULT AND DISCUSSION

The questionnaire instrument was distributed to 28 students in grade II Islamic Elementary School Insan Mulia Semarang. Students looked enthusiastic but also confused in filling out a questionnaire with a Guttman scale. The Guttman scale is used to get a definite answer between yes and no. After 28 grade II students filled out the questionnaire, the researcher conducted a structured interview to find answers to the questionnaire with more in-depth knowledge about using the traditional abacus teaching aid. Students' perceptions of their knowledge of using visual aids in mathematics for teaching means four, 1) use of visual aids in teaching; 2) attitudes of students towards the use of visual aids; 3) use and frequency of teaching aids; 4) benefits of using teaching aids (Suliani, 2020).

The researcher wanted to know the basic knowledge of class II students about using the traditional abacus teaching aid without prior introduction or explanation from the teacher. The view of constructivism is that learning success does not only depend on the environment or learning conditions but also students' prior knowledge. Students' initial knowledge in learning is very important so that misconceptions do not occur when learning to use traditional abacus teaching aids.

The causes of misconceptions experienced by students can come from the students themselves, which are related to the student's prior knowledge (preconceptions), stages of cognitive development that are not by the concepts being studied, limited and incorrect student reasoning, students' abilities to capture and understand the concepts that are being studied. learned, and students' interest in learning the concepts being taught. Prior knowledge, students know many things from their daily experiences even before the formal school level, and it is from this experience that students' initial knowledge is formed (Yulianti, 2017). But unfortunately, the initial knowledge that students get can be right or wrong, this is because the source of student information is inaccurate and the experiences experienced by students also vary. Even though the initial knowledge possessed by these students is very important because it affects the acquisition of student knowledge at the next level of education.

Traditional Abacus Visual Aids

Abacus is a visual aid that can develop thinking and arithmetic skills (Pramita, 2017). The ability to think is an ability that combines mental intelligence and experience (Ardani & Purwaningsih, 2018). The ability to think in learning mathematics is to think creatively and logically. Counting is the basis of several sciences that are used in everyday life (Kristiawati, 2021). One of the aids for counting is the traditional abacus. Historically, the use of the abacus was used by the Babylonians in the form of a board sprinkled with sand. Along with the times, the use of the abacus has become more practical because it has changed in form (Anjasrina et al., 2020). Abacus is an acronym for Education System for Optimizing Children's Brain Potential (Dianto et al., 2018).

The abacus was used several centuries before the introduction of the Indo-Arabic numbering system and is still used by traders in various parts of the world for example in China (Halimah et al., 2019). Learning the abacus can activate the right and left brain in humans in a balanced way (Wijayanti & Suswandari, 2022). The abacus teaching aid can be used for quick calculations, besides that the abacus is useful for optimizing the functions of the brain, especially the right brain which includes analysis, memory, logic, imagination, high reaction, and many more. Children will be required to play with their hands, logic, and imagination. Here computers can create enthusiasm for learning by allowing students to interact more directly with their environment and reality by allowing them to learn

independently according to their abilities and interests.

Many benefits are obtained by learning the abacus, namely balancing the right brain and left brain. Train the power of imagination and can increase the concentration of learning. When studying the abacus, students practice concentrating, so they can solve arithmetic calculations quickly and accurately. Thus, students will get used to focusing on what they are practicing (Mahendra et al., 2022). The abacus can be used in arithmetic operations such as addition, subtraction, multiplication, and division (Ardani & Purwaningsih, 2018). There is also an abacus called the *abacus, cipoa, swipoa, simsuan, abacus,* or *sorokan* a traditional calculating tool used in Japan and China (Budiningsih and M. Syamsul, 2007). Using an abacus or abacus as a medium for learning appropriately can help students understand the subject matter (Furner & Worrell, 2017).

According to Zuliana et al (2015), the advantage of learning using the abacus is that it can be considered cheap and easy to do by the teacher if they can master the abacus, students will be more active, can calculate number operations manually in a short time. Meanwhile, the weakness of learning by using an abacus is that it requires a teacher who must be capable or expert in using the abacus, generally, students who learn the abacus for the first time will find it difficult and take a long time to provide understanding for students, the information conveyed is easily lost from students' memories, communication that occurs is generally only one way, it is not easy to know the absorption of students.

An abacus is an ancient calculating tool made of wooden boards with a single-sided ax containing marbles that can be moved left and right (Ronalis, 2015). The abacus is a simple calculating tool made of wood or plastic. In the form of a rectangular box that is divided into two parts, top and bottom with one-valued beads at the bottom (Kristiawati, 2021). An abacus or abacus is made of a wooden frame, plastic, or other material which is designed with several poles filled with abacus seeds that can be moved around (Siregar & Z, 2021). An abacus is a traditional Japanese or Chinese numbering tool in the form of a rectangular box in which several beads are placed. The shape of the counter is a vertical bar with a pip of five above the dividing line and only four pips of unit value below the dividing line (Insani & Hartono, 2017).

In reality, the abacus has many versions and forms but has a purpose for the same thing which is to help count. Numeracy skills are needed in everyday life. Numeracy skills are a very important tool for mastering other fields of study as well as a means of communication to deal with various problems of everyday life (Insani & Hartono, 2017). The abacus in this study uses a traditional abacus made of plastic with an attractive color with 100 beads. This abacus is easy to find and buy at markets, children's toy stores, or online marketplaces at affordable prices.

Figure 1. Traditional abacus visual aids

The abacus is a traditional calculating tool but still survives today (Anjasrina et al., 2020). Nowadays, in this sophisticated and digital era, sometimes we forget about traditional teaching aids. Abacus is still needed as a teaching aid, especially for elementary school students. Children of 6-8 years of primary school age are in the transitional age between pre-operational and pre-operational (Nafiah & Hartatik, 2018). If we have never given concrete experiences

to children, never have demanded children to understand

Student Knowledge of the Traditional Abacus

Class II students, totaling 28 children, took a questionnaire using the Guttman scale about knowledge of using the traditional abacus teaching aid with 20 statements. Some grade II students were not yet fluent in reading, so when working on the questionnaire the teacher assisted them in reading the statements on the questionnaire. The Guttman scale is used to get a definite answer between yes and no, considering that grade II students are included in the lower grades who get confused when given many choices when answering.

The 20 statements in the questionnaire contained knowledge of the traditional abacus teaching aids for grade II students, starting with asking about participation in learning, asking the teacher to use learning aids or not, and continuing with statements about knowledge of traditional abacus teaching aids. Here are 20 statements in the questionnaire that must be answered by grade II students, as follows.

Table 1. Statements on the questionnaire instrument

No	Statement
1.	I followed all the lessons well
2.	My teacher uses visual aids when learning mathematics
3.	I know the form of traditional abacus props.
4.	There are 100 beads on the traditional abacus props.
5.	The traditional abacus props have bright and attractive colors.
6.	I know how to use traditional abacus props.
7.	The traditional abacus props are easy to use.
8.	Traditional abacus teaching aids help me learn to count.
9.	Traditional abacus teaching aids are difficult to use.
10	Traditional abacus teaching aids make me confused in learning to count.
11	Traditional abacus teaching aids can be used to enhance learning.
12	A traditional abacus teaching aid is useful for teaching subtraction.
13	Traditional abacus props are useful for learning multiplication.
14	Traditional abacus props are useful for learning division
15	I feel happy when I learn to use traditional abacus props.
16	I feel sad when I learn to use the traditional abacus teaching aid.
17	I have a traditional abacus prop.
18	I do not own a traditional abacus prop.
19	Traditional abacus props have affordable prices (cheap).
20	Traditional abacus props are easy to buy anywhere.

The response of class II students when filling out the questionnaire was very enthusiastic. 23 out of 28 grade II students can read fluently and understand sentences well. 2 children can read even though they are still stammering and 3 children need help reading and explaining each statement in the questionnaire. Some students also asked many times because they felt confused. After filling out the questionnaire, structured interviews were conducted with 3 students selected randomly. However, also confirmed the questionnaire answers if there were ambiguous answers, as in questions 15 and 16, as well as 17 and 18. If the student answers Yes in points 15, 16 and 17, 18 it needs to be confirmed again with an interview about the clarity of the answers.

Here are the results of filling out a questionnaire about the knowledge of class II students' abacus teaching aids, as follows.

Table 1. The results of filling out the questionnaire instrument

Number	Answers	
	Yes	No
1	25	3
2	24	4
3	14	14
4	17	11
5	21	7
6	16	12
7	21	7
8	21	7
9	9	19
10	14	14
11	25	3
12	26	2
13	26	2
14	24	4
15	22	6
16	12	16
17	12	16
18	17	11
19	21	7
20	22	6

It can be seen in the table, class II students at Islamic Elementary School Insan Mulia Semarang can follow the lesson well and state that their teacher always uses visual aids when teaching. When interviewed, it turned out that the teaching aids used by the teacher were simple props or those in schools and not traditional abacus props. However, it turns out that many grade II students already know the shape, from the number of beads to the color of the conventional abacus, with a percentage of 61%. Many grade II students at SDIT Insan Mulia can use and know the use of traditional abacus teaching aids, namely as many as 21 out of 28 children. However, confusion occurred in the statements of points 7 and 9. 21 children stated that the traditional abacus props were easy to use, but 9 children stated the traditional abacus props were difficult to use. 2 students answered ambiguously when asked it turned out they were confused about statement point 9.

As many as 90% of grade II students at Islamic Elementary School Insan Mulia also understood the use of traditional abacus teaching aids, namely to help count in addition, subtraction, multiplication, and division even though it was 50 % of students also stated that they were still confused about using traditional abacus props. It turns out that grade II students know the form and use of conventional abacus props because they were introduced to them in kindergarten, namely learning to start counting. Learning to count in kindergarten is only taught early arithmetic, namely addition and subtraction 1-10, counting with objects 1-20, mentioning the sequence of numbers 1-20, pairing number symbols with objects 1-20, imitating number symbols with objects 1-10, able to distinguish 2 groups of objects that are the same in number, not the same in number, many and few in number. Therefore, in practice, counting in kindergarten is carried out in an interesting and varied way (Olua et al., 2021). The use of traditional abacus visual aids when learning makes grade II students feel happy even though there are 6 children answering statements ambiguously or inappropriately. Of the 28 grade II students at Islamic Elementary School Insan Mulia, 12 students already have traditional abacus props at home and use them to learn to count when at home with their parents. Traditional abacus teaching aids also have affordable prices and are easy to buy anywhere according to the statements of grade II students as much as 76%.

From the results of filling out the questionnaire regarding the knowledge of traditional abacus teaching aids, it turned out that many students already knew the use of traditional abacus teaching aids. From that, the teacher who acts as a facilitator should provide facilities and situations so that the student's knowledge process runs smoothly (Santosa, Nurfaizah, 2022). The learning facilities here are media and visual aids that are adequate, not just sober but really should be held. The learning process is fun, not just as it is, but it is done optimally. As a leader in the teaching and learning process, the teacher plays a strategic role in efforts to improve the quality of education. Teachers are required to have creativity by using a variety of teaching aids, to create innovative learning to help students be motivated in learning mathematics (Suliani, 2020).

One thing that can be done is to use visual aids as learning media which can stimulate students to imagine or reason. Elementary school children between the ages of seven and 12 have their intellectual development included in the concrete operational stage because their logical thinking is based on the physical manipulation of objects (Wahab, 2023). In other words, the use of media (including teaching aids) in learning mathematics in elementary school is indeed necessary, because it is by the child's thinking stage. Moreover, elementary school students, especially grade II SDIT Insan Mulia, apparently already know the teaching aids for learning that have been introduced since kindergarten. Kindergarten is an educational institution that functions to

assist parents in providing education in early childhood (Wuryani, 2023). The world of education at the kindergarten level is a world that cannot be separated from play and also various children's play tools. Kindergarten is a place to learn and also play for children who have various facilities and pre-facilities to support the implementation of a good and quality learning process. In line with research from Romlah et al (2016), early childhood educators introduce number operations starting from the simplest or most basic using play methods and abacus props to improve numeracy skills.

There is no more reason for teachers not to use visual aids in learning, especially learning mathematics. The teacher must also be able to master the material and be able to present a method that makes the teaching and learning process more enjoyable. Teachers must be able to act as designers (planners), implementers (executors), and evaluators (assessors) of learning activities. The teacher is the most dominant factor because it is in the hands of the teacher that learning success can be achieved. The quality of teacher teaching can directly or indirectly affect the quality of learning in general (Wuryani, 2023). This is consistent with the teacher's responsibilities to facilitate learning so the teacher can stimulate guide and enhance students' knowledge.

CONCLUSION

The use of media and mathematical teaching aids that support learning at Islamic Elementary School Insan Mulia Semarang is inadequate, so teachers only use books, blackboards, and simple visual aids in a school environment. Improper use of teaching materials leads to a lack of understanding of students, especially in understanding the basic concepts of second-order integer multiplication and division. A visual aid that helps students understand the basic concepts of integer multiplication and division is the traditional abacus. Before looking at the effectiveness of using traditional abacus teaching aids in learning mathematics, students' knowledge of the use of traditional abacus teaching aids will be analyzed. The result is that many grade II students already know the shape and use of traditional abacus props. They admitted that they already knew the traditional abacus teaching aid for learning to start counting since they were in kindergarten.

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